Computer Science 4602
Fall 2020
Quiz 3

Answer all of the questions. ***Check your work***.

1. Write **T** next to each of the following that is true, and **F** next to each that is false.

   (a) A language is computable if and only if it can be solved by a finite-state machine.

   (b) Every infinite language is uncomputable.

   (c) Every finite language is computable.

   (d) Every computational problem can be solved by an algorithm.

   (e) The Halting Problem is conjectured to be uncomputable, but that conjecture has not been proved.

   (f) There exists an algorithm that determines whether a given multivariate polynomial has a real-valued zero.

   (g) There exists an algorithm that determines whether a given multivariate polynomial has an integer-valued zero.

   (h) A Turing reduction from A to B is a program that solves B and that is allowed to ask questions about A at no cost.

   (i) A Turing reduction from language A to language B is not required to ask a question about the membership of a value in B.

2. Suppose A is the set of all multivariate polynomials that have an integer zero and B is the set of all multivariate polynomials that do not have an integer zero. Give a Turing reduction from A to B.

3. Suppose A is language $\{M \mid M$ is a finite-state machine with alphabet $\{a, b\}$ that accepts all strings that contain only symbol $a\}$. Is A computable? Justify your answer. You will receive no credit for a yes or no answer without convincing justification.

4. Let G be the following program that takes a program p as a parameter.

```
{G(p):
   if Run(p, 1) ≅ 1
      return p
   else
      return 0
}
```

Is G an algorithm? Justify your answer. You will receive no credit for a yes or no answer without convincing justification.